




Slide 1



Guide for Oxygen Compatibility Assessments on Oxygen Components and Systems


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No notes


Slide 2

Application



Oxygen Compatibility Assessment Tool


- Specifically for oxygen systems
- Ties the “risk management” process together
- Evaluates:
 - Compatibility of materials
 - Risk of ignition
 - Effect of ignition
- Recommends design changes to achieve:
 - Low probability of ignition
 - Low consequence of ignition



No notes


Slide 3

Gaining Wide Subscription



Oxygen Compatibility Assessment Tool


- Organizations using this approach
 - ASTM
 - ASTM G63 for evaluating nonmetals
 - ASTM G94 for evaluating metals
 - CGA and EIGA/IGC
 - G4.4-2003 (4th edition) for oxygen pipeline systems
 - IGC Document 13/02 for oxygen pipeline systems
 - NFPA
 - NFPA 53 for oxygen-enriched atmospheres
 - NASA
 - NASA-STD-6001 for space vehicles, test facilities, and GSE



No notes


Slide 4

Approach



Oxygen Compatibility Assessment Tool


- Establish worst-case operating conditions
- Assess flammability of oxygen-wetted materials
- Evaluate presence and probability of ignition mechanisms
- Evaluate kindling chain
- Determine reaction effect
- Document results



No notes


Slide 5

Establish Worst-Case Operating Conditions



Oxygen Compatibility Assessment Tool


- Several factors affect fire hazards
 - Oxygen concentration
 - Temperature
 - Pressure
 - Flow rate
 - Cleanliness level
- Assess at most severe conditions
 - Most extreme fire hazards addressed



No notes


Slide 6

Assess Materials Flammability



Oxygen Compatibility Assessment Tool


- Identify oxygen-wetted materials
- Compile data
- Assess flammability
 - Apply data using technical judgment
 - Can be difficult (and frustrating) because of configurational dependency



No notes


Slide 7

Evaluate Ignition Mechanisms



Oxygen Compatibility Assessment Tool


- Identify and rank ignition mechanisms that can cause fires
- Consider characteristic elements
 - Reference ASTM G-88, Manual 36
- Common ignition mechanisms include:
 - Particle impact
 - Heat of compression
 - Flow friction
 - Mechanical friction
 - Mechanical impact
 - Static electricity
 - Electric arc
 - Others



No notes


Slide 8

Evaluate Kindling Chain



Oxygen Compatibility Assessment Tool


- Determine if an internal fire event will exceed the confines of the component
- Evaluate burn-through potential
 - Heats of combustion
 - Geometry and thickness
 - Quantity of oxygen available



No notes


Slide 9

Determine Reaction Affect



Oxygen Compatibility Assessment Tool


- Evaluate the consequence of fire
 - Personnel
 - Equipment
 - Mission



No notes


Slide 10

Document Results



Oxygen Compatibility Assessment Tool


- Records specific configuration evaluated
- Facilitates communication to concerned parties
- Provides archival information
- Enables quick evaluation of anomaly effects



No notes


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Oxygen Compatibility Assessment Team



Oxygen Compatibility Assessment Tool

- Analysts must be specifically trained
- Best done by a team
- Training available through ASTM

A horizontal timeline at the bottom of the slide, labeled with years from 05 to 25. Each year is associated with a small image representing a significant space event: 05 (Earth from space), 06 (Space Shuttle), 07 (Space Shuttle), 08 (Space Shuttle), 09 (Space Shuttle), 10 (Space Shuttle), 11 (Space Shuttle), 12 (Space Shuttle), 13 (Space Shuttle), 14 (Space Shuttle), 15 (Space Shuttle), 16 (Space Shuttle), 17 (Space Shuttle), 18 (Space Shuttle), 19 (Space Shuttle), 20 (Space Shuttle), 21 (Space Shuttle), 22 (Space Shuttle), 23 (Space Shuttle), 24 (Space Shuttle), 25 (Space Shuttle).